Union Carbide Corporation
Metals Division
Technology Department-Engineering
Niagara Falls, New York 14302

File No. 11330

DESIGN MEMORANDUM
SPONSOR: T. J. KAGETSU

PROJECT: MAGNESIUM BASE ALTERATION PRODUCTS
(150,000 TPY Case)

PLAINTIFF'S EXHIBIT
UC-773

By: V. Darden Holt

Date: February 8, 1984

Design Memo No. 1
Revision No. 0
Subject: Prefeasibility Study Plant Capital and Operating Cost

1.0 SCOPE

This memo provides prefeasibility study plant capital and operating costs for a facility at the Coalinga Mine site to produce a low magnetite magnesium base product from asbestos ore.

2.0 INTRODUCTION

The objective is to produce a low magnetite magnesium base product with no toxicity to be used in magnesium production.

The Product Development Department has determined that Coalinga asbestos ore when heat treated to 1300°C forms Forsterite and Enstatite. This product does not carry the toxic burden as that experienced for asbestos and upon removal of magnetite is a chemically satisfactory substitute for dolomite in magnesium production. Magnetite removal is not absolutely necessary but makes the product more valuable.

This memo is based on projections which require additional development work to determine the production feasibility. A prefeasbility capital cost estimate for a production facility at the Coalinga Mine site is included along with a preliminary estimate of the operating cost.

3.0 PLANT DESCRIPTION AND CAPITAL COST

The design is based on a facility being constructed at the Coalinga Mine site to produce 150,000 TPY of altered product containing low magnetite. The basis for this study is listed in Table I. The flowsheet as depicted by Drawing No. S-15389 consists of screening to remove the +1/2 mesh material, jigging and classifying to remove approximately one half of the magnetite, dewatering, drying, kiln treatment, cooling and bulk loading. Two water wells will be provided near the mine site to supply process water. The electric power load for the facility was estimated to be 3500 KW and is to be supplied from transmission lines not more than one mile

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from the mine site. Bulk loading is to be by truck but no provisions are included for road improvements to the mine site from main roads. Equipment is included for oil firing to the dryer and kiln unit as the availability of gas at the mine site has not been resolved and may even be more expensive.

The facility will include process buildings, maintenance buildings, office and laboratory.

The prefeasibility capital cost estimate was prepared by F. R. Angelori for the facility and is $14.6MM as indicated in Table II.

4.0 OPERATING COST

The cost for production was estimated to be $40.18 as indicated in Table III. Table IV is a comparison made with the Hot Springs operations. The Hot Springs cost indicated in Table IV represents operations at the Hot Springs Plant from the ore feed to the cooler discharge less the costs for salt and lime feed to the off-gas scrubber. Also the Hot Springs plant cost figure does not include ore or supervision. The remaining figures in Table IV provide for plant supervision, mining, the difference in electric power cost between the two locations, and additional heat needed for the asbestos conversion operation. The energy figure has also been adjusted for the difference in the natural gas price at Hot Springs, Arkansas, and the delivered oil price at the Coalinga Mine site.

It is noted that Tables III and IV agree reasonably close and indicate that the production cost should be $40 to $47 per ton of product.

5.0 WITHOUT MAGNETITE REMOVAL

The prefeasibility capital cost for a system to produce a magnesium base product from Coalinga asbestos ore with no magnetite removal is estimated to be $12.6MM. It is also estimated that the production cost for the magnesium base product with no magnetite removal is $36.55 per ton.

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TABLE I
STUDY BASIS
LOW IRON MAGNESIUM BASE ALTERATION PRODUCTS FROM COALINGA ORE

1.	Production Rate	150,000 ton/yr
2.	Bulk Density of Ore	75 lb/ft^3
3.	Oversize Reject in Ore	20%
4.	Water of Hydration in Ore	14%
5.	Moisture content in Ore	20%
6.	Moisture Content of Filter Cake	22%
7.	Tailings from Jig	30%
8.	On Stream Time	82%
9.	Operating Shifts per Day	3
10.	Operating Days per Week	7

TABLE II

PREFEASIBILITY STUDY COST ESTIMATE
LOW IRON MAGNESIUM BASE ALTERATION PRODUCTS FROM COALINGA ORE
PRODUCTION RATE 150,000 TPY

	Capital $M
Ore Feed System	522
Magnetite Removal Equipment	1347
Drying, Heat Treating and Product Cooling	4676
Product Handling and Loading	378
Process and Cooling Water Supply	388
Electric Substation and Supply Line	135
Process, Maintenance, Office and Lab Buildings	295
Fuel Oil Supply Tanks	85
Structural Steel, Concrete, Piping and Ductwork	1450
Electrical and Instrumentation	450
Total Directs	9726
Engineering	2919
Contingency	1459
Start-Up Modifications	496
Total	14,600

TABLE III

PREFEASIBILITY STUDY PRODUCTION COST
LOW IRON MAGNESIUM BASE ALTERATION PRODUCTS FROM COALINGA ORE
PRODUCTION RATE 150,000 TPY

	COST PER YEAR $M	UNIT COST PER TON $
MINING		
Contract Mining ($2.00/ton of feed)	779	5.19
DIRECT MATERIALS		
Electric Power (3500 HP Connected, 80% Operating, 300 days/yr., $0.0644/KWH)	968	6.46
Fuel Oil (552 gph, 300 days/yr., $25/bbl.)	2366	15.77
Subtotal	3334	22.23
DIRECT LABOR		
Mill Operators (3 men, 24 hrs./day, 365 days/yr., $17/hr.)	447	2.98
Shift Leaders (1 man, 24 hrs./day, 365 days/yr., $18/hr.)	158	1.05
Utilities (2 men, 8 hrs./day, 5 days/wk., $16/hr.)	67	0.45
Subtotal	672	4.48
MAINTENANCE		
Electricians (1 man, 8 hrs./day, 5 days/wk., $18/hr.)	37	0.25
Mechanics (4 men, 8 hrs./day, 5 days/wk., $17/hr.)	142	0.95
Oiler (1 man, 8 hrs./day, 5 days/wk., $16/hr.)	33	0.22
Materials	400	2.67
Subtotal	612	4.08
PERIOD		
Salaries (7 men, $40M/man)	280	1.87
Taxes (guess)	250	1.66
Office (phone, supplies, misc. materials)	100	.67
Subtotal	630	4.20
TOTAL OPERATING COST	6027	40.18

TABLE IV

PREFEASIBILITY STUDY PRODUCTION COST COMPARISON WITH HOT SPRINGS, ARKANSAS, PLANT
LOW IRON MAGNESIUM BASE ALTERATION PRODUCTS FROM COALINGA ORE
PRODUCTION RATE 150,000 TPY

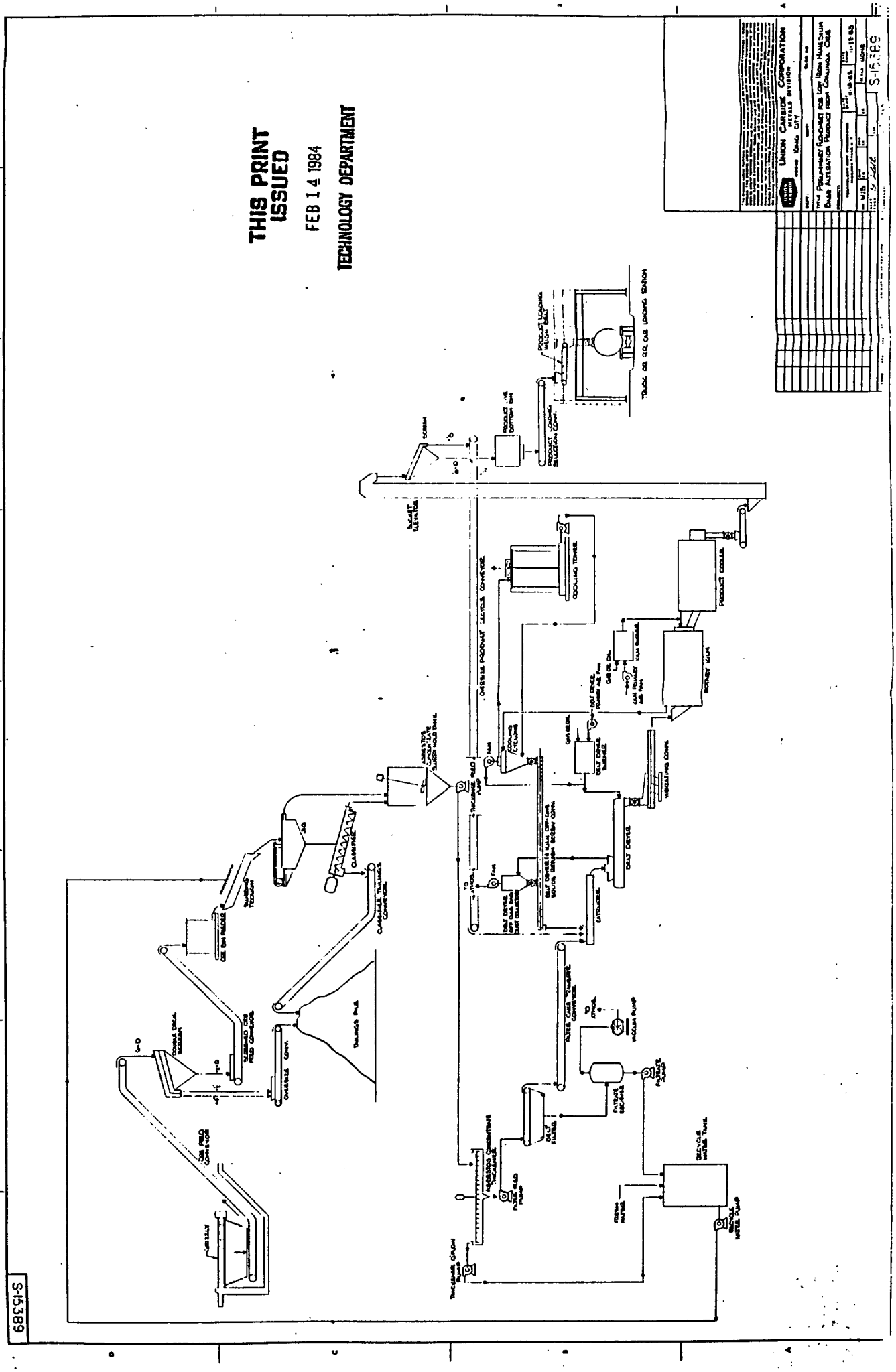
	COST PER TON $
Hot Springs, AR, Plant Operational Cost (Note 1)	24.89
Period Cost (see TABLE III)	4.20
Contract Mining ($2.00 per ton of feed)	5.19
Addition Fuel Cost (Note 2)	10.34
Addition Electric Power Cost (Note 3)	2.01
TOTAL	46.63

Note 1 - This unit cost includes operational labor, maintenance materials and labor, electricity, and fuel for the Hot Springs Plant operations section from the plant ore feed through the cooler after the roaster. Not included are costs for mining, salt and lime to neutralize the scrubber solution.

Note 2 - Includes fuel cost of 0.41 per therm for oil at the Coalinga Mine site vs. 0.39 per them for the Arkansas Plant. Includes fuel to boil off the additional water that will be experienced from the asbestos kiln feed.

Note 3 - Includes difference in power cost between Hot Springs, Arkansas, Plant (0.04225 per KWH) and King City Plant (0.0644 per KWH).

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